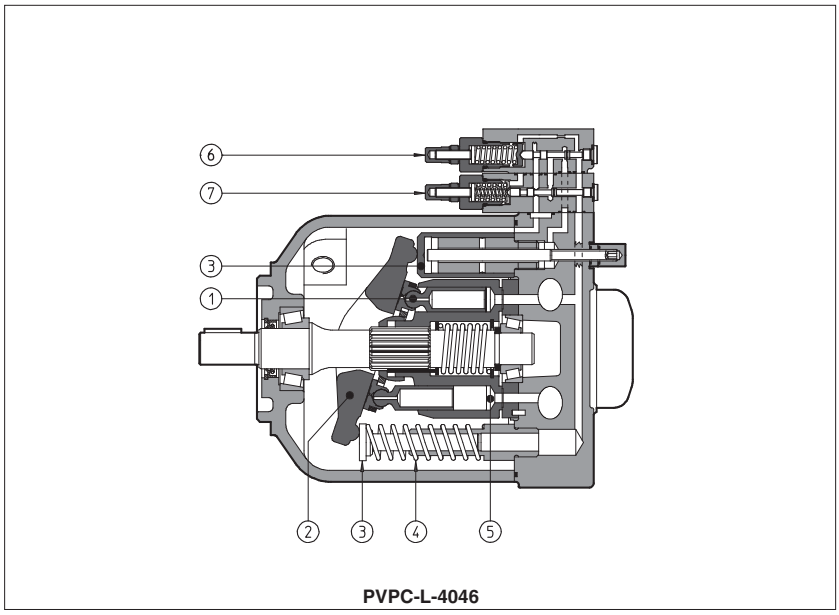
# Axial piston pumps type PVPC

variable displacement, by a full line of mechanical controls




**PVPC-L-4046**

PVPC are variable displacement axial piston pumps for high pressure operation, with low noise level, suitable for hydraulic oils or synthetic fluids having symilar lubricating characteristics.
The actual displacement is dependent on the lenght of stroke of the pumping pistons ①. This lenght of stroke is determined by the position of the swashing plate ② that is achieved by two servo pistons ③ with differential areas, against a spring ④.
The rotating barrel ⑤ forces the pistons in a circular path in and out of the barrel and fluid displacement takes place.
Typical section on side shows version L with manual pressure compensator ⑥ and flow regulation ⑦.
The available hydraulic controls are shown in sections [8]. The wide range of electrohydraulic proportional controls is shown in tab. A170.
SAE J744 mounting flange and shaft (see note 1).
Max displacement: 29-46-73-88 cm³/rev.
Max pressure: 280 bar working
350 bar peak.

## 1 MODEL CODE

**PVPC** **X2E** – **C** – **4** **046** / **31044** / **1** **D** – **X** **24DC** **10** **/***

**PVPC**: Variable displacement axial piston pump

**X2E**: Additional suffix for pumps with through shaft:
**XA** = intermediate flange SAE A
**XB** = intermediate flange SAE B
**XC** = intermediate flange SAE C (only for size 5)
Additional suffix for double pumps:
**X2E** = with a fixed displacement pump type PFE (see tab. A005)

**C**: Type of control (see section [8]):
**C** = manual pressure compensator
**CH** = manual pressure compensator, with venting
**R** = remote pressure compensator
**L** = load sensing (pressure & flow)
**LW** = constant power (combined pressure & flow)
For electrohydraulic proportional controls, see table A170

**4**: Size:
**3** = for displacement 029
**4** = for displacement 046
**5** = for displacement 073 and 090

**046**: Max displacement of axial piston pump **(1)**:
**029** = 29 cm³/rev
**046** = 46 cm³/rev
**073** = 73 cm³/rev
**090** = 88 cm³/rev

**31044**: Type of PFE (for double pumps), see tab. A005

**1**: Shaft (SAE Standard) **(2)**:
**1** = keyed (7/8" for 029 - 1" for 046 - 1 1/4" for 073 and 090)
**5** = splined (13 teeth for 029 - 15 for 046 - 14 for 073 and 090)

**D**: Direction of rotation (viewed at the shaft end)
**D** = clockwise
**S** = counterclockwise

**X**: **X** = without connector (only for CH version)
See section [4] for available connectors, to be ordered separately

**24DC**: Supply voltage, see section [5] (only for CH version)

**10**: Series number

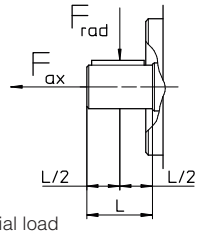
**/***: Seals material:
omit for NBR (mineral oil & water glycol)
**PE** = FPM
See notes in section [2]

**1) optional intermediate displacements 35 and 53 cc/rev are available on request**
**2) pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request**

## 2 OPERATING CHARACTERISTICS

| Pump model | | PVPC-*-3029 | PVPC-*-4046 | PVPC-*-5073 | PVPC-*-5090 |
|---|---|---|---|---|---|
| Displacement | [cm³/rev] | 29 | 46 | 73 | 88 |
| Theoretical max flow at 1450 rpm | [l/min] | 42 | 66,7 | 105,8 | 127,6 |
| Max working pressure / Peak pressure | [bar] | 280/350 | 280/350 | 280/350 | 250/315 |
| Min/Max inlet pressure | [bar abs.] | 0,8 / 25 | 0,8 / 25 | 0,8 / 25 | 0,8 / 25 |
| Max pressure on drain port | [bar abs.] | 1,5 | 1,5 | 1,5 | 1,5 |
| Power consumption at 1450 rpm and at maximum pressure and displacement | [kW] | 19,9 | 31,6 | 50,1 | 54,1 |
| Max torque on the first shaft | [Nm] | Type 1 210 / Type 5 270 | Type 1 350 / Type 5 440 | Type 1 670 / Type 5 810 | Type 1 670 / Type 5 810 |
| Max permissible load on drive shaft | [N] Fax | 1000 | 1500 | 2000 | 2000 |
| | Frad | 1500 | 1500 | 3000 | 3000 |
| Speed rating | [rpm] | 500 ÷ 3000 | 500 ÷ 2600 | 500 ÷ 2600 | 500 ÷ 2200 |

**External load position**




Fax = axial load
Frad = radial load

**Notes:** For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes.
Maximum pressure for all models with water glycol fluid is 160 bar, with option /PE is 190 bar.
Max speed with options /PE and for water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

## 3 MAIN CHARACTERISTICS OF VARIABLE DISPLACEMENT AXIAL PISTON PUMP TYPE PVPC

| | |
|---|---|
| Installation position | Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line lenght is 3 m. |
| Ambient temperature | from -20°C to +70°C |
| Fluid | Hydraulic oil as per DIN 51524...535; for other fluids see section 1 |
| Recommended viscosity | 15÷100 mm²/sec at 40°C (ISO VG 15÷100). Maximum start-up viscosity: 1000 mm²/sec |
| Fluid contamination class | ISO 4401 class 21/19/16 NAS 1638 class 10 (filters at 25 µm value with ß25 ≥ 75 recommended) |
| Fluid temperature | -20°C +60°C -20°C +50°C (water glycol) -20°C +80°C (seals /PE) |

### 3.1 Coils characteristics (for version CH)

| | |
|---|---|
| Insulation class | H |
| Connector protection degree | IP 65 |
| Relative duty factor | 100% |
| Supply voltage and frequency | See electric feature 5 |
| Supply voltage tolerance | ± 10% |

## 4 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 FOR VERSION CH

The connectors must be ordered separately

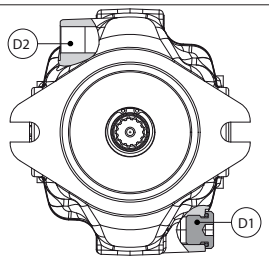
| Code of connector | Function |
|---|---|
| **SP-666** | Connector IP-65, suitable for direct connection to electric supply source |
| **SP-667** | As SP-666 connector IP-65 but with built-in signal led, suitable for direct connection to electric supply source |

## 5 ELECTRIC FEATURES FOR VERSION CH

| External supply nominal voltage ±10% | | Power consumption | Nominal courrent | Coil characteristics |
|---|---|---|---|---|
| DIRECT CURRENT | 12 DC<br>24 DC | 19,2 W | 1,61 A<br>0,80 A | Insulation Class: **H**<br>Protection degree: **IP65** |
| ALTERNATE CURRENT | 24/50AC<br>110/50 AC<br>220/50 AC | 19 W | 0,89 A<br>0,19 A<br>0,09 A | |

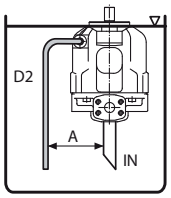
Average values based ambient/coil temperature of 20°C.

## 6 INSTALLATION POSITION



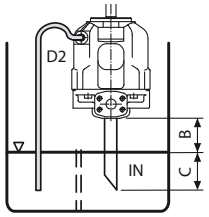

The pump is supplyed whit drain D2 open, and D1 plugged. Before installation fill the pump with hydraulic oil for at least 3/4 of its volume, keeping it in horizontal position. With exception of pump mounted below the oil level, we recomend to interpose a baffle plate between inlet and drain line.

**VERTICAL INSTALLATION**



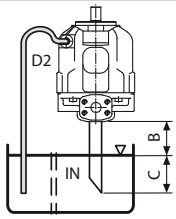

**INSIDE THE TANK**

Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm




**INSIDE THE TANK**

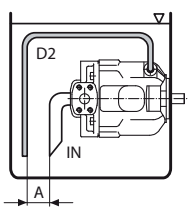
Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm




**OUTSIDE THE TANK, above oil level**

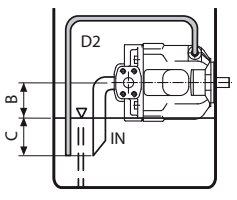
Minimum inlet pressure = 0,8 bar absolute
B ≤ 800mm, C= 200mm

**HORIZONTAL INSTALLATION**



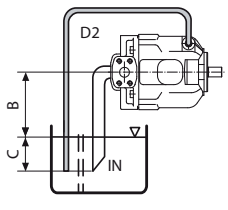

**INSIDE THE TANK**

Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm



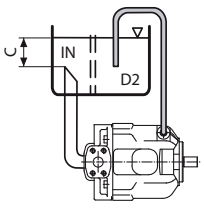

**INSIDE THE TANK**

Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0,8 bar (absolute)
B ≤ 800mm, C= 200mm




**OUTSIDE THE TANK, above oil level**

Minimum inlet pressure = 0,8 bar (absolute)
B ≤ 800mm, C= 200mm




**OUTSIDE THE TANK, below oil level**

C= 200mm

**IN:** inlet line - **D1:** drain line - **A:** minimum distance between inlet and drain line - **B+C:** permissible suction height - **C:** inlet line immersion dept

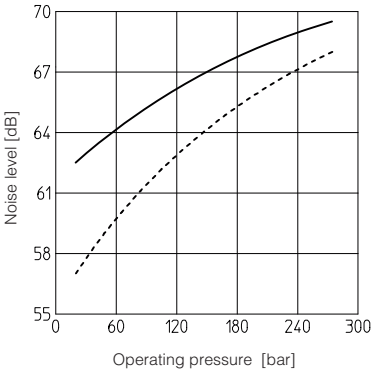
## 7 DIAGRAMS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

### 7.1 Noise level curves

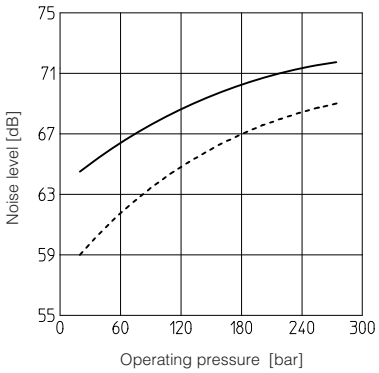
Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics -Test procedure to define the ambient noise level - Pumps
Shaft speed: 1450 rpm.

—— = Qmax ------ = Qmin

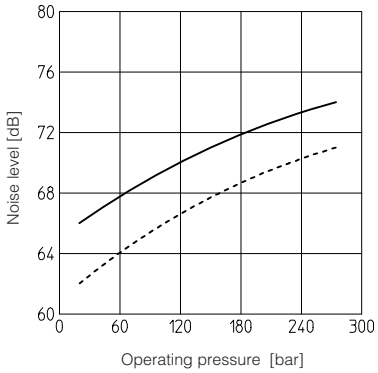
**PVPC-*-3029**




**PVPC-*-4046**



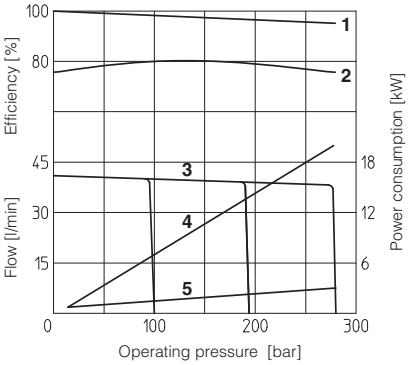

**PVPC-*-5073 and PVPC-*-5090**



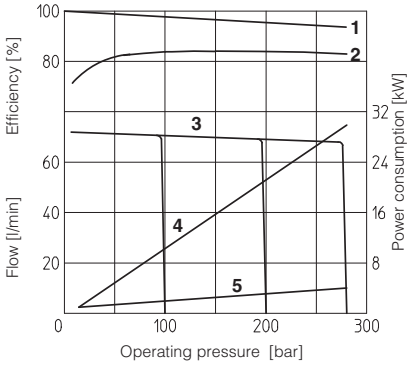

### 7.2 Operating limits

**1** = Volumetric efficiency
**2** = Overall efficiency
**3** = Flow versus pressure curve
**4** = Power consumption with full flow
**5** = Power consumption at pressure compensation

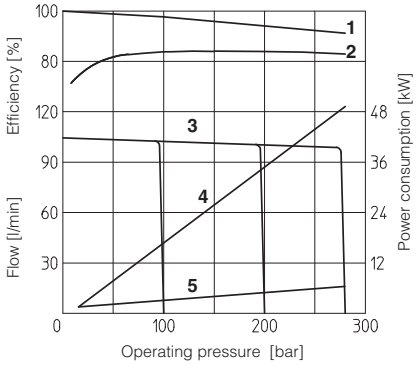
**PVPC-*-3029**




**PVPC-*-4046**



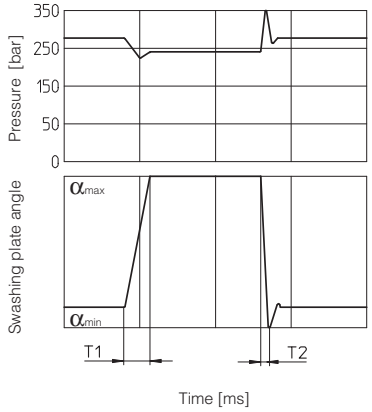

**PVPC-*-5073**



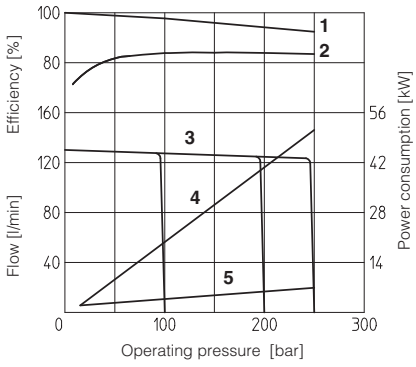

### 7.3 Response times

**7.3.1** Response times and pressure peack due to variation 0% ∅ 100% ∅ 0% of the pump displacement, obtained with an istantaneously opening and shut-off of the delivery line.

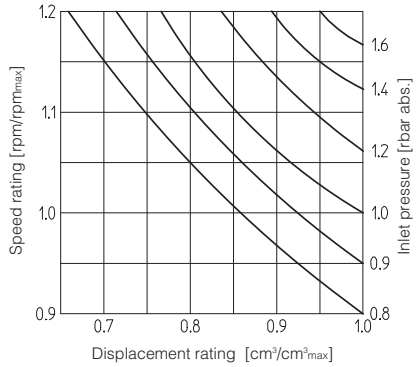
| Pump type | **T1** (ms) | **T2** (ms) |
|---|---|---|
| PVPC-*-3029 | 31 | 19 |
| PVPC-*-4046 | 44 | 20 |
| PVPC-*-5073 | 50 | 25 |
| PVPC-*-5090 | 53 | 28 |

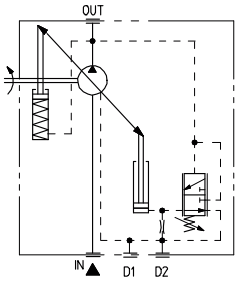



**PVPC-*-5090**




**7.3.2** Variation of inlet pressure and reduction of displacement with increasing speed rating

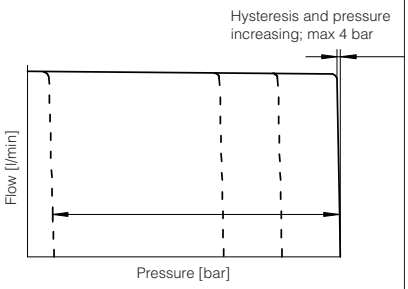


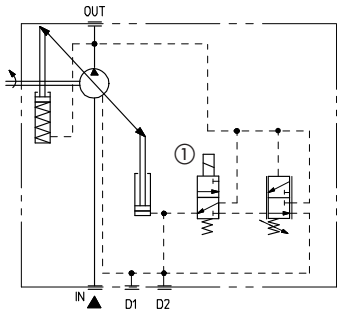



**C**

**Manual pressure compensator**

The pump displacement decreases when the line pressure approaches the setting pressure of the compensator. The pump supplies only the fluid required by the system. Pressure may be steplessly adjusted at the pilot valve.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)



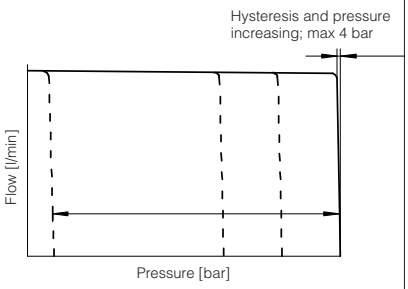



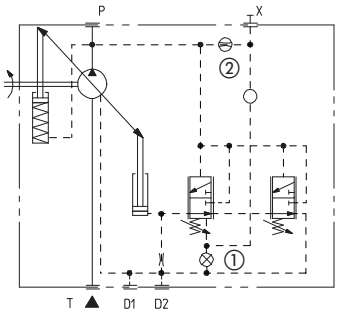

① solenoid venting valve

**CH**

**Manual pressure compensator with venting**

As C plus venting function, when a long unloading time is required and heat generation and noise have to be kept at lowest level.
Venting valve solenoid voltage, see section 5
Venting valve OFF = null displacement
Venting valve ON = max displacement
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)

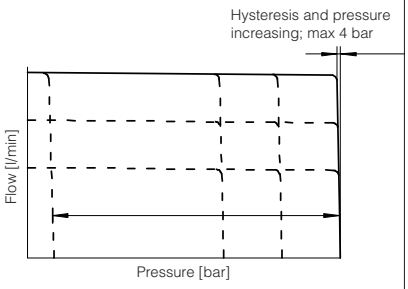


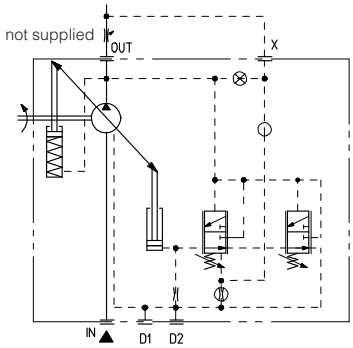




**R**

**Remote pressure compensator**

As C, but with remote setting of the compensator by means of a pressure relief valve on the piloting line X.
This version can be obtained from version L using a blind plug UNI 5923 M4x12 in pos. ① and a restrictor M4 drilled ø 0,75 mm in pos. ②.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)

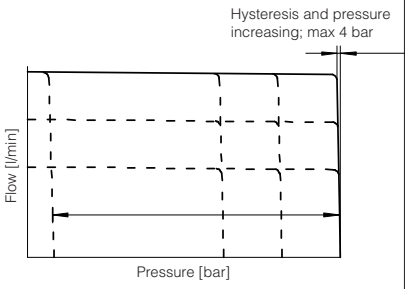


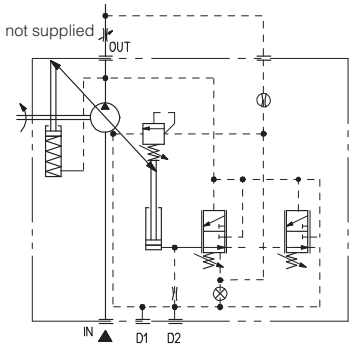




**L**

**Load sensing**

The pump displacement is automatically adjusted to maintain a constant (load indipendent) pressure drop across an external throttle. Changing the throttle regulation, the pump flow is consequently adjusted.
Load sensing control always incorporates an hydraulic compensator to limit the maximum pressure.
Compensator setting range: 20 ÷ 350 bar (315 bar for 090)
Compensator standard setting: 280 bar (250 bar for 090)
Differential pressure setting range: 10 ÷ 40 bar
Differential pressure standard setting: 14 bar

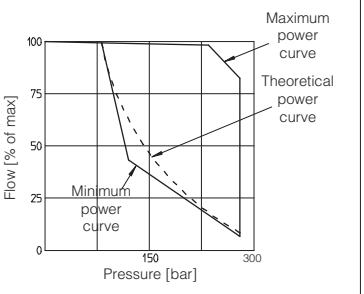



**LW**

**Constant power**

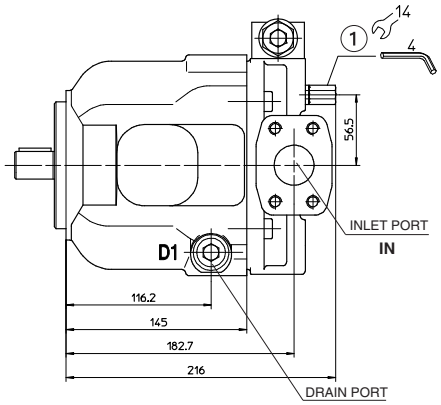
In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.
For the best regulation, minimum working pressure is 80 bar.
While selecting LW control, the required value of power must be communicated with the order (ex. 10 kW at 1450 rpm).

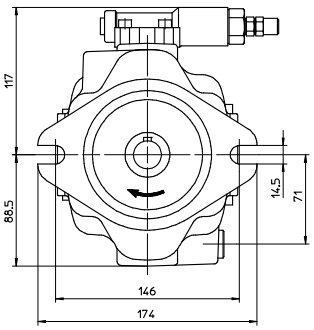


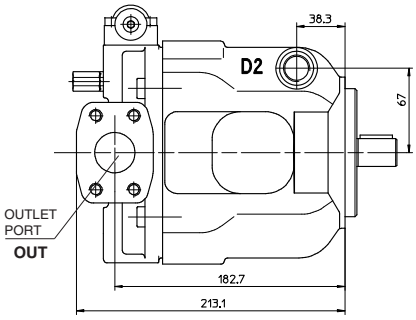
## 9 DIMENSIONS OF PVPC-*-3029: BASIC VERSION “C” CONTROL

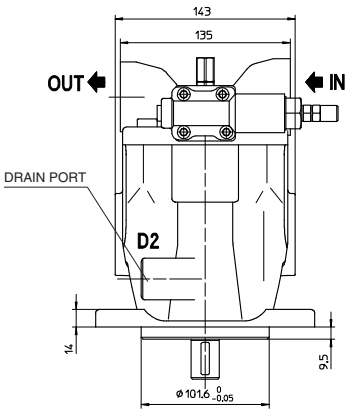
**PORTS DIMENSION**

**IN** = Flange SAE 3000 1 1/4”
**OUT** = Flange SAE 6000 3/4”
**D1, D2** = 1/2” BSPP
① = Regulation screw for max displacement 1,5 cm³/rev per turn. Adjustable range 50% to 100% of max displacement.
In case of double pump the regulation screw is not always available, please contact our technical office.



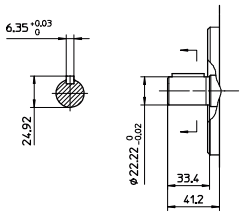



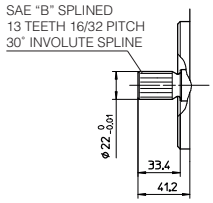




**Mass**: 18 kg

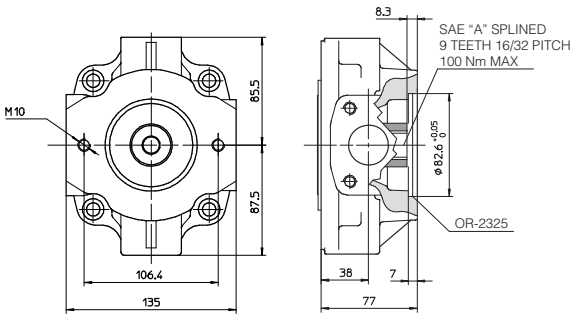
**SHAFT TYPE “1”**



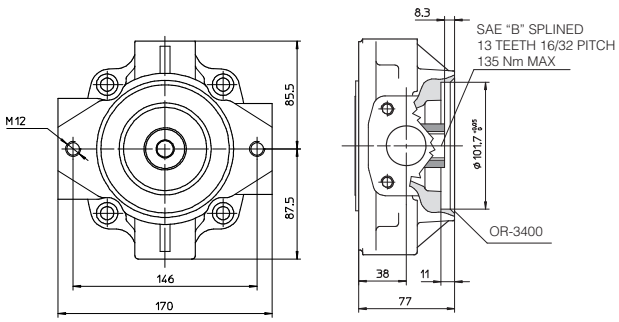

**SHAFT TYPE “5”**




**INTERMEDIATE FLANGE SAE “A” FOR PFE-31**




**INTERMEDIATE FLANGE SAE “B” FOR PFE-41**

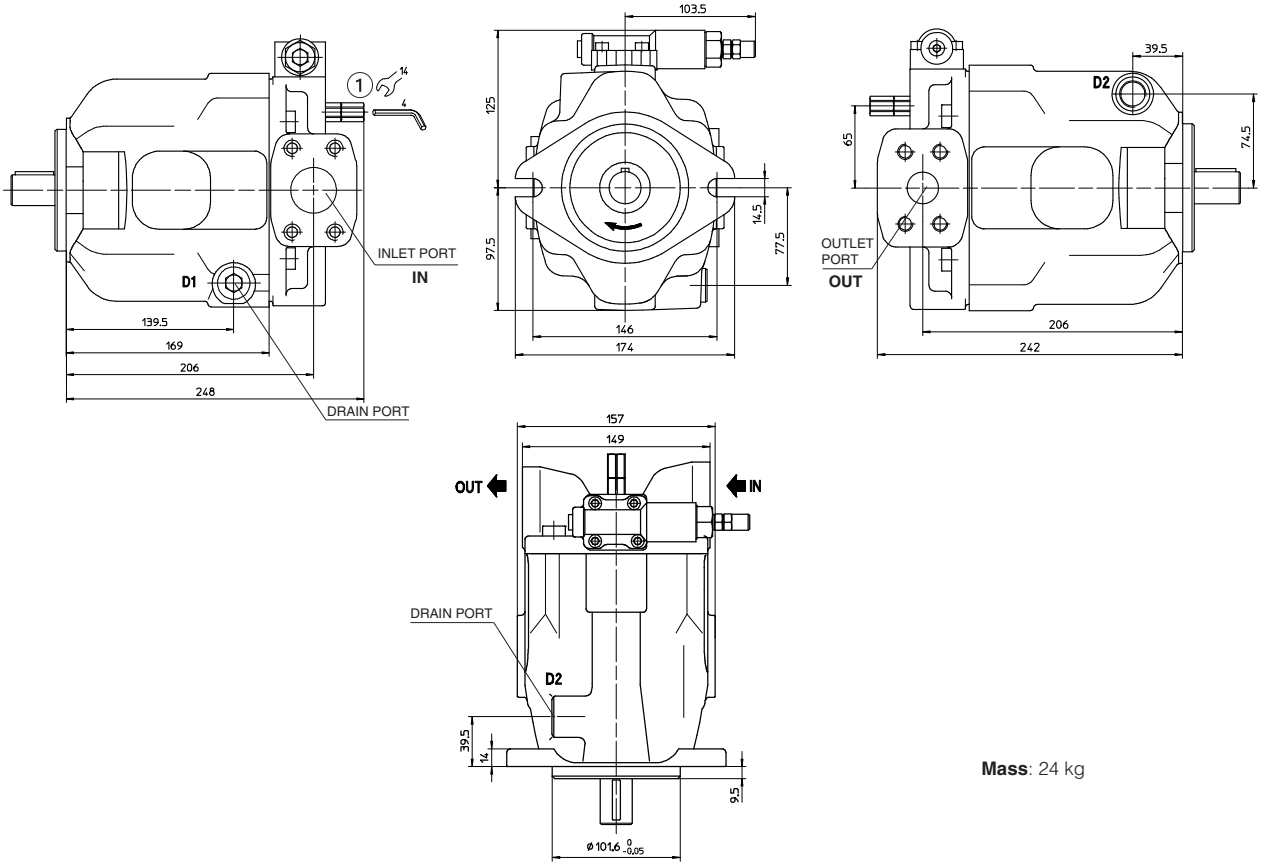



Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

## 10 DIMENSIONS OF PVPC-*-4046: BASIC VERSION "C" CONTROL

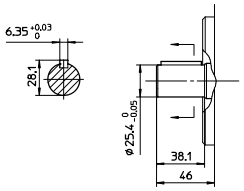
**PORTS DIMENSION**

**IN** = Flange SAE 3000 1 1/2"
**OUT** = Flange SAE 6000 1"
**D1, D2** = 1/2" BSPP
① = Regulation screw for max displacement 2,2 cm³/rev per turn. Adjustable range 50% to 100% of max displacement.
In case of double pump the regulation screw is not always available, please contact our technical office.

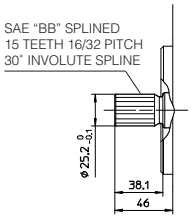



**Mass**: 24 kg

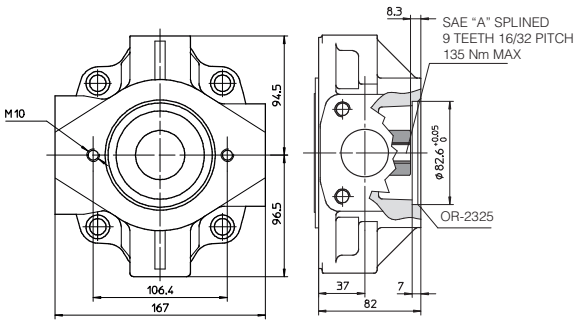
**SHAFT TYPE "1"**



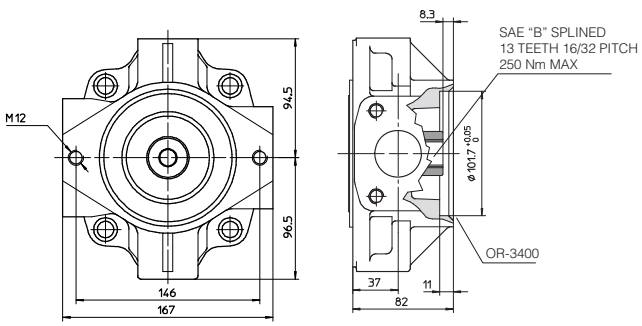

**SHAFT TYPE "5"**




**INTERMEDIATE FLANGE SAE "A" FOR PFE-31**

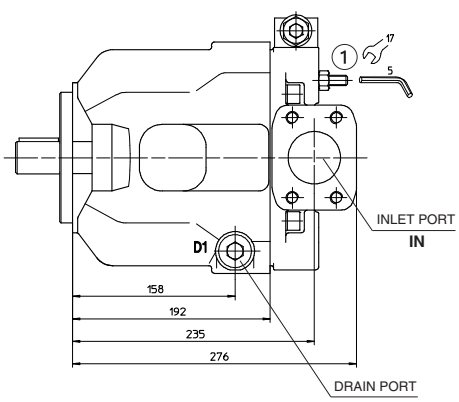


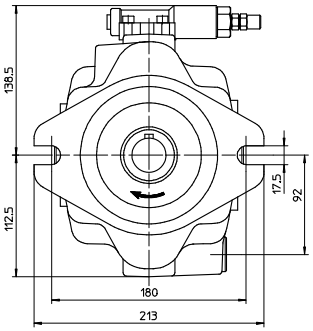

**INTERMEDIATE FLANGE SAE "B" FOR PFE-41**

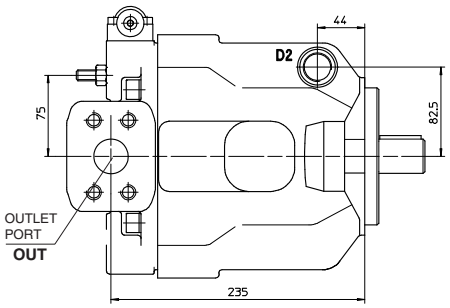



Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

## 11 DIMENSIONS OF PVPC-*-5073 and PVPC-*-5090: BASIC VERSION "C" CONTROL

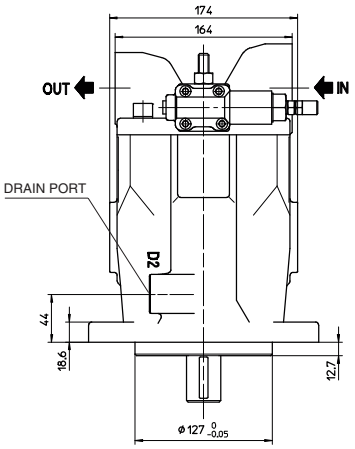


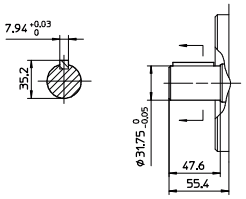

**PORTS DIMENSION**

IN = Flange SAE 3000 2"
OUT = Flange SAE 6000 1 1/4"
D1, D2 = 3/4" BSPP
① = Regulation screw for max displacement 3,2 cm³/rev per turn. Adjustable range 50% to 100% of max displacement. In case of double pump the regulation screw is not always available, please contact our technical office.

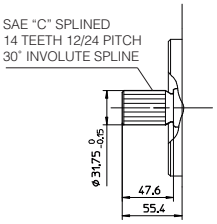



**Mass**: 33 kg

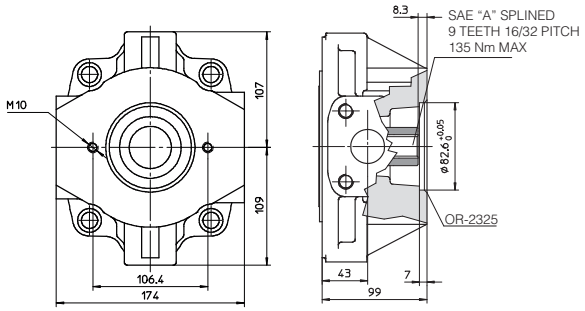
**SHAFT TYPE "1"**



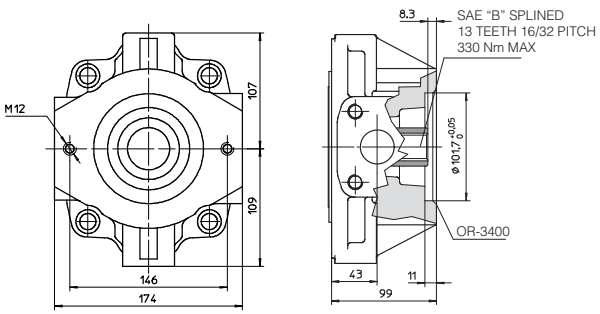

**SHAFT TYPE "5"**



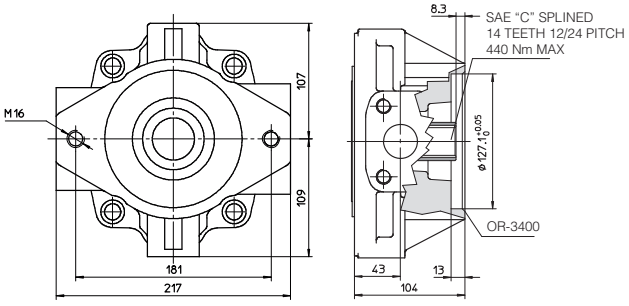

**INTERMEDIATE FLANGE SAE "A" FOR PFE-31**




**INTERMEDIATE FLANGE SAE "B" FOR PFE-41**



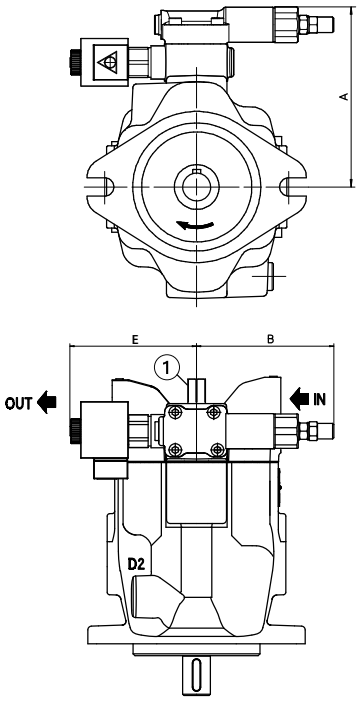

**INTERMEDIATE FLANGE SAE "C" FOR PFE-51**



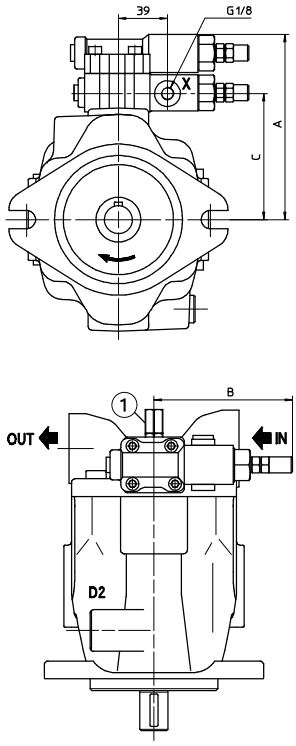

Drawing show pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted

## 12 DIMENSIONS OF PVPC: OTHER CONTROLS

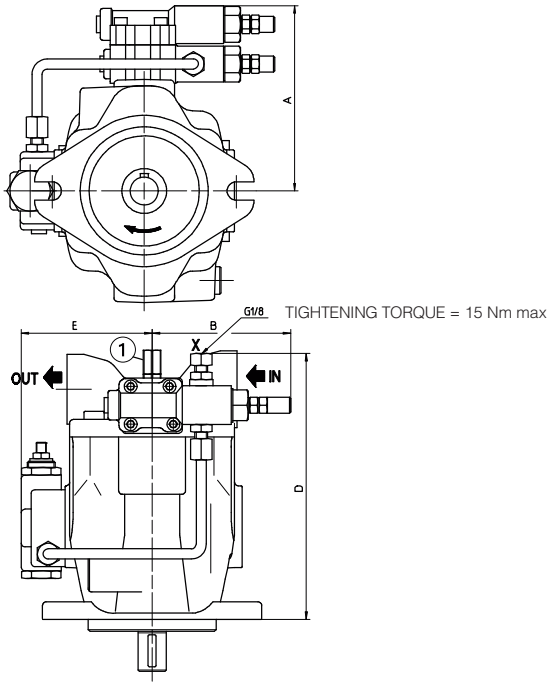
**VERSION CH**




**VERSIONS L, R**




**VERSION LW**




① = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement).
In case of double pump the regulation screw is not always available, please contact our technical office.

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups

| Pump type | Version | A | B | C | D | E | Mass (kg) |
|---|---|---|---|---|---|---|---|
| PVPC-*-3029 | **CH** | 144 | 111 | - | - | 102 | 22 |
| | **L -R** | 144 | 111 | 100 | - | - | 19,2 |
| | **LW** | 144 | 111 | - | 211 | 104 | 20 |
| PVPC-*-4046 | **CH** | 153 | 111 | - | - | 102 | 28 |
| | **L -R** | 153 | 111 | 109 | - | - | 25,2 |
| | **LW** | 153 | 111 | - | 235 | 111 | 26 |
| PVPC-*-5073 PVPC-*-5090 | **CH** | 166 | 111 | - | - | 102 | 36,9 |
| | **L -R** | 166 | 111 | 122 | - | - | 34,2 |
| | **LW** | 166 | 111 | - | 258 | 120 | 35 |